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Early architectural modifications in the right ventricle myocardium of children with tetralogy of Fallot: Preliminary data by morphological analysis

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Malignant ventricular arrhythmias (VA) may happen remote from tetralogy of Fallot (TOF) repair. Monomorphic ventricular tachycardia (VT) using surgical scar-related reentry circuits is the most common form of VA, but ventricular fibrillation (VF) unrelated to VT has been described. Right ventricular fibrosis may be part of the substrate for VF and also VT. We aimed to assess right ventricular fibrosis in young children with TOF.

Methods We prospectively included 9 children requiring surgery for the management of TOF. Right ventricle tissue of the outflow tract resected during surgery was analyzed under conventional microscopy.

Results Surgical indications were complete repair of TOF with pulmonary stenosis ($n = 7$), complete repair with right-ventricle-to pulmonary-artery-conduit of TOF with pulmonary atresia ($n = 1$) and redo surgery for outflow tract and pulmonary valve stenosis six years after the complete repair ($n = 1$). Median age at complete repair was 5.5 months old (range: 3 to 75, 3 children coming from developing countries having been operated after 2 year-old). Median $Sp0^2$ was 85% (range: 65 to100%). Pulmonary annulus section was required in 62.5%. Morphological analysis revealed a marked subendocardial fibrosis, fibrosis of the interstitium and of the support vessels. Morphology of cardiomyocytes suggests that they remain immature in most cases. However, an early maturation was observed in some myocardial sectors in a 27-month-old child with cardiomyocytes exhibiting acquisition of a mature brick-wall micropattern. Cardiomyocytes are often multinucleated with some being trinucleated. MIB-1 revealed some cardiomyocytes to be in mitosis cycle.

Conclusion Early fibrosis and cardiomyocytes alterations of the right ventricle outflow tract before any surgery in TOF are already present in very young children. If these early abnormalities are evolutive and if they represent a facilitating substrate for late VA remains to be demonstrated.

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